



An Evaluation of Differing Schemes to Classify Emergency Department Chief Complaints for ESSENCE

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ESSENCE

- Syndromic surveillance system
 - Automated capture and analysis of pre-existing data streams
- Emergency department (ED) chief complaint (CC) data play key role
- Free-text ED CC parsed by a natural language processing (NLP) algorithm



ESSENCE Components

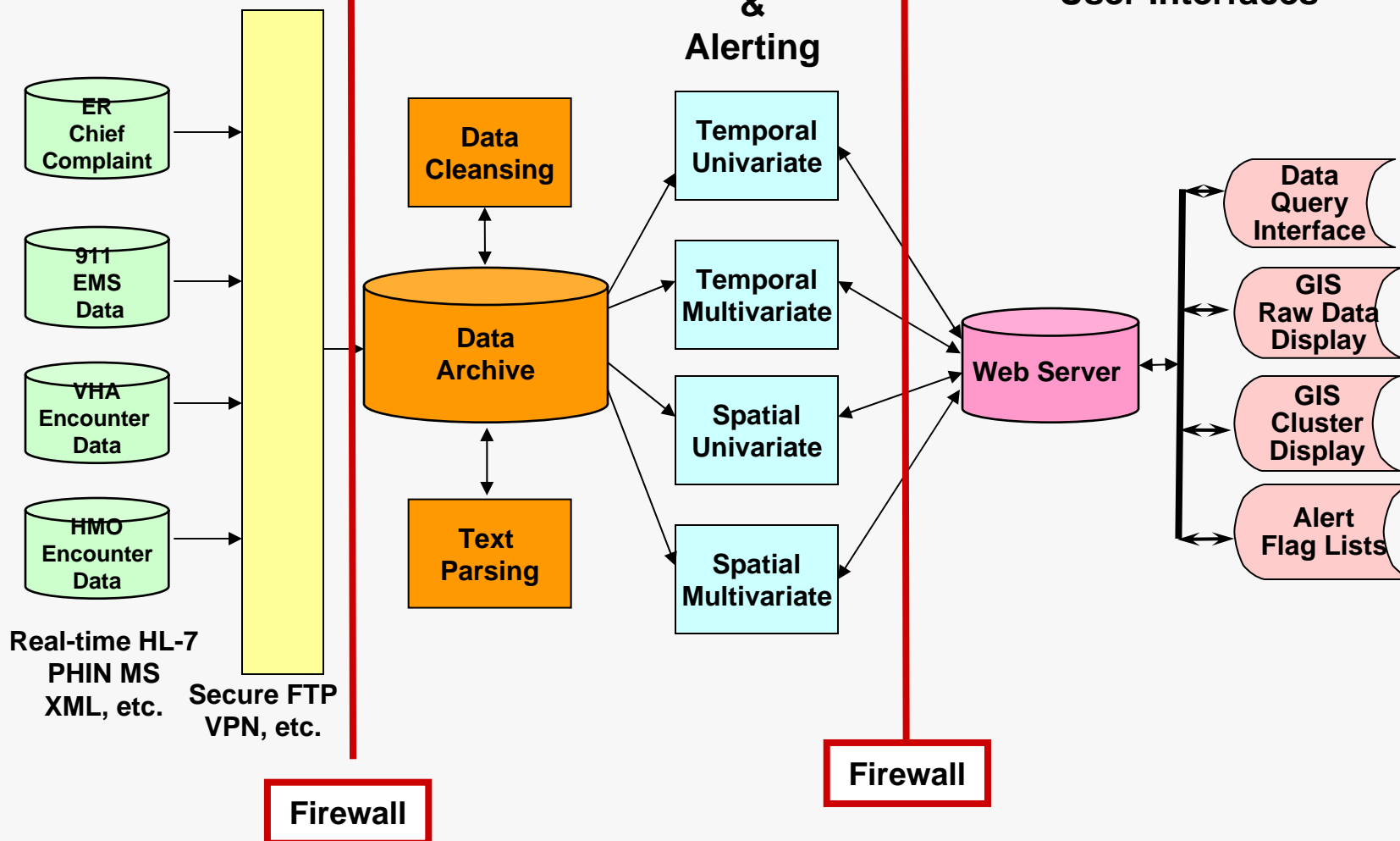
Health Condition
Indicator Data

Comms

Archiving

Analysis
&
Alerting

User Interfaces





Classification of CC

- By expert opinion or consensus of experts
- Classification systems differ
 - Syndromes under surveillance
 - What constitutes a given syndrome
 - Hierarchy vs. no hierarchy of syndromes
- Validity of classification has both technical and diagnostic aspects



Classification Schemes

- Various exclusionary terms (All)
 - MVA, other injury
 - Drugs, Psychiatric
- ‘Any and all’ syndromes (ESSENCE)
- ‘Code to the Left’ or other forms of ‘One Visit – One Syndrome’ (Others)



Code to the Left Strategies

- Some syndromes are more specific than others, place them to the left
- Some syndromes are more worrisome to miss, place them to the left
- Some conditions add more noise than signal, place them to the left



Study Question

- What are the effects of altering classification scheme on the validity of ED CC classification?
 - Abdominal (ABD) exclusions effect on GI
 - Cardiac exclusions effect on RESP
 - ‘Code to the Left’ effect on all syndromes



Study Design

- Capture all ED records with both CC & ICD9 discharge diagnosis
- Process records thru the ESSENCE NLP parser and classification scheme
- Alter the ESSENCE classification scheme in various ways and re-process records
- Evaluate performance of each scheme by SENS and SPEC



Study Design

- Use 2003 CDC expert consensus syndrome groupings (SYN & ICD9)
- Not so much an evaluation of ESSENCE
- Rather, a stable framework upon which to evaluate the different classification schemes



Our Code to Left Strategy

- Try to move worrisome (BT) and specific syndromes to the left
- SI / Death > RASH > BOT-Like > HEM ILL
> LYMPH > LOCAL > NEURO > RESP >
GI > FEVER > Other



Syndromic Surveillance

- Ingestion / cleaning data
- Process CC / bin CC into syndrome
- Analytics / alerts
- PH Officer review
- PH response
- Outcome altered



Syndromic Surveillance

- Ingestion / cleaning data
- **Process CC / bin CC into syndrome**
- Analytics / alerts
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Results

- 66,812 ED visits with CC & ICD9 d/c Dx
- Only 5 of 51 reporting hospitals
- Only 3% of archived ED CC data



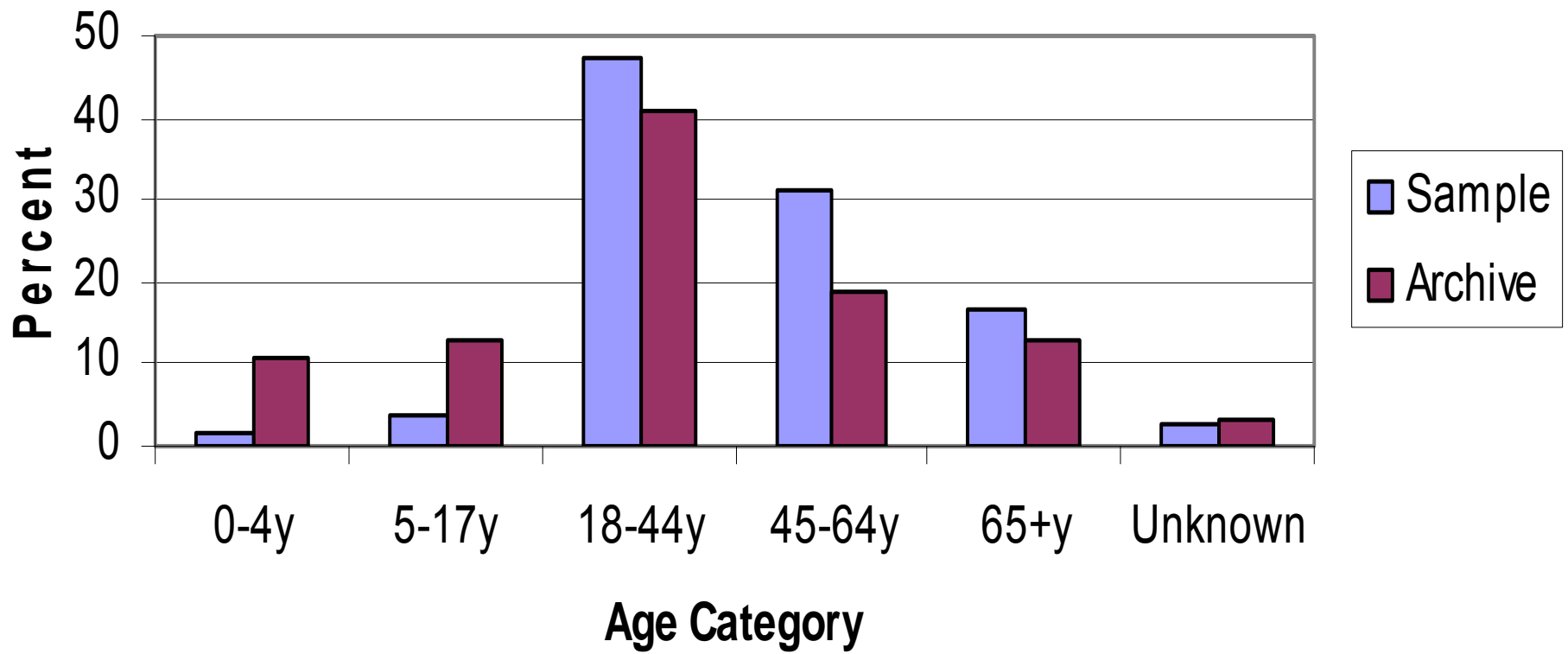
Results

Hospital	Records	% of Sample (n=66,812)	% of that Hospital in Archive
1	12,156	18.2	26.4
2	1,675	2.5	84.6
3	13,439	20.1	45.9
4	10,247	15.3	96.6
5	29,289	43.8	21.9



Results

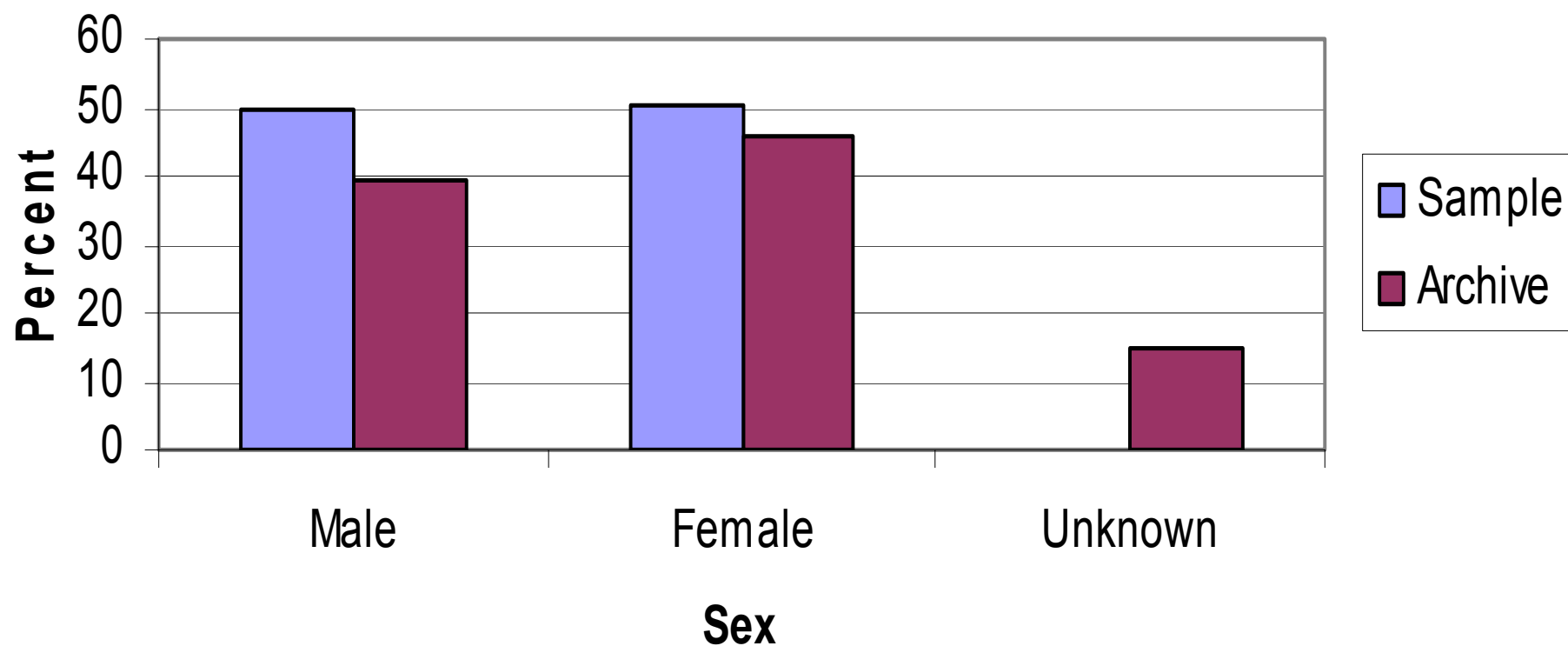
Age Distribution of Sample vs. Total Archive





Results

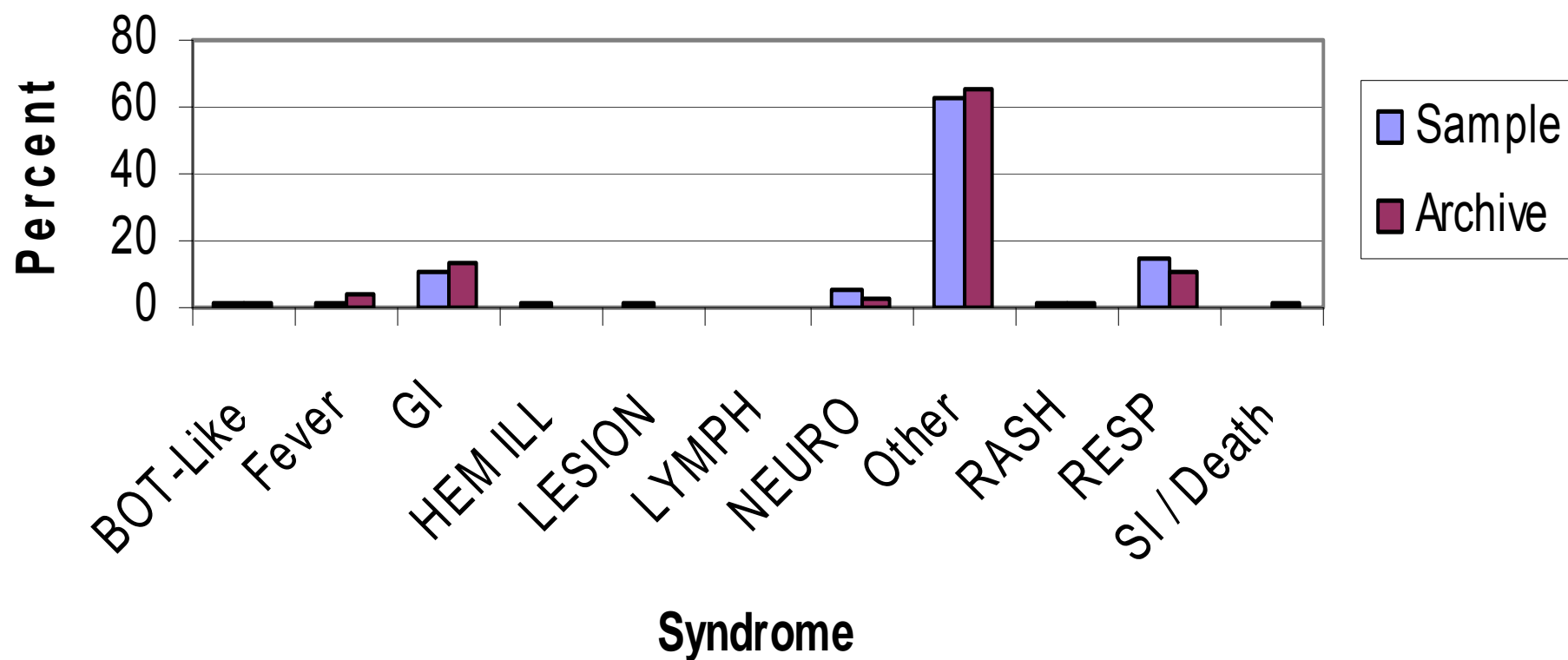
Sex Distribution of Sample vs. Total Archive





Results

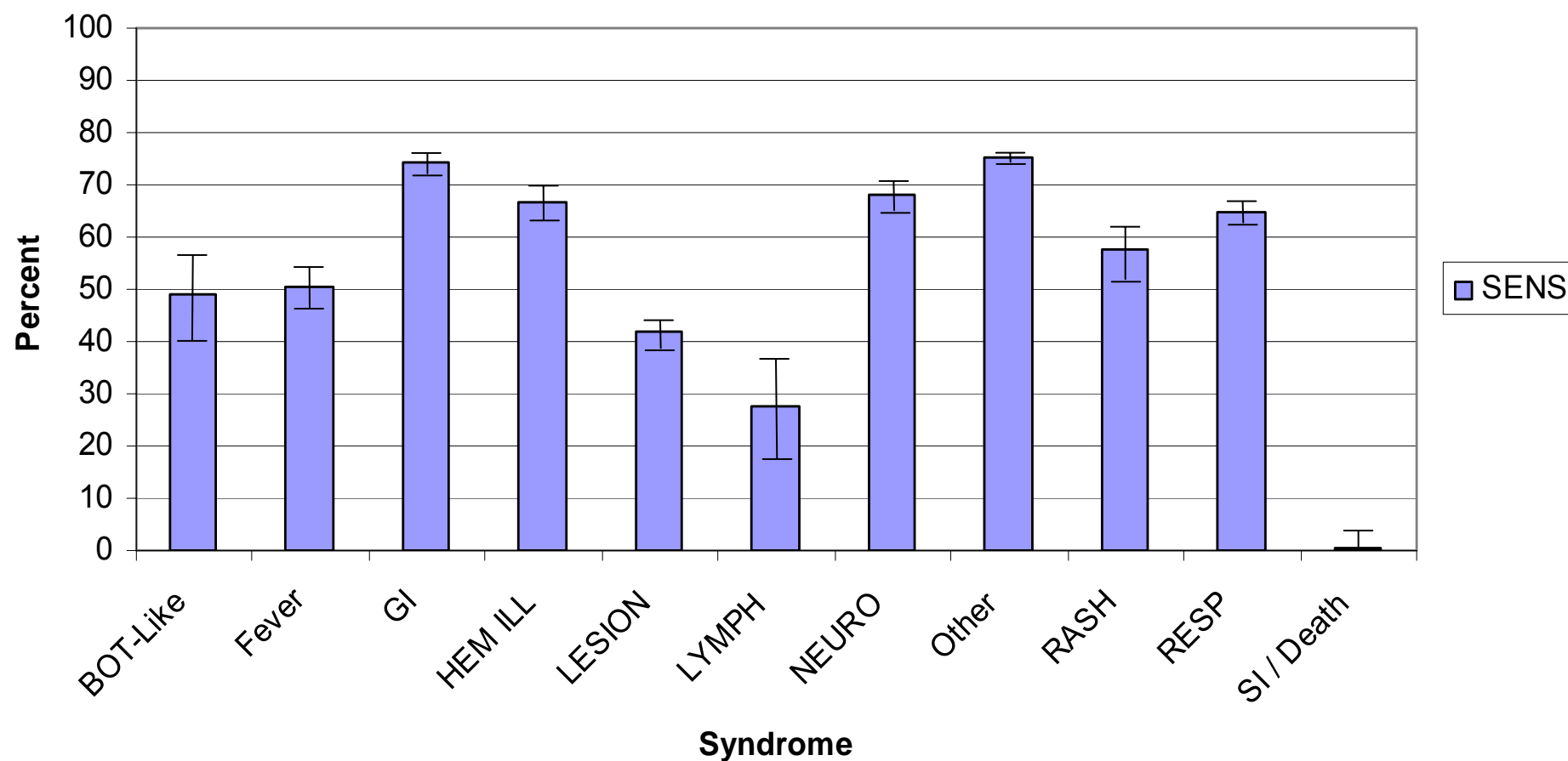
Syndrome Distribution Sample vs. Total Archive





Results

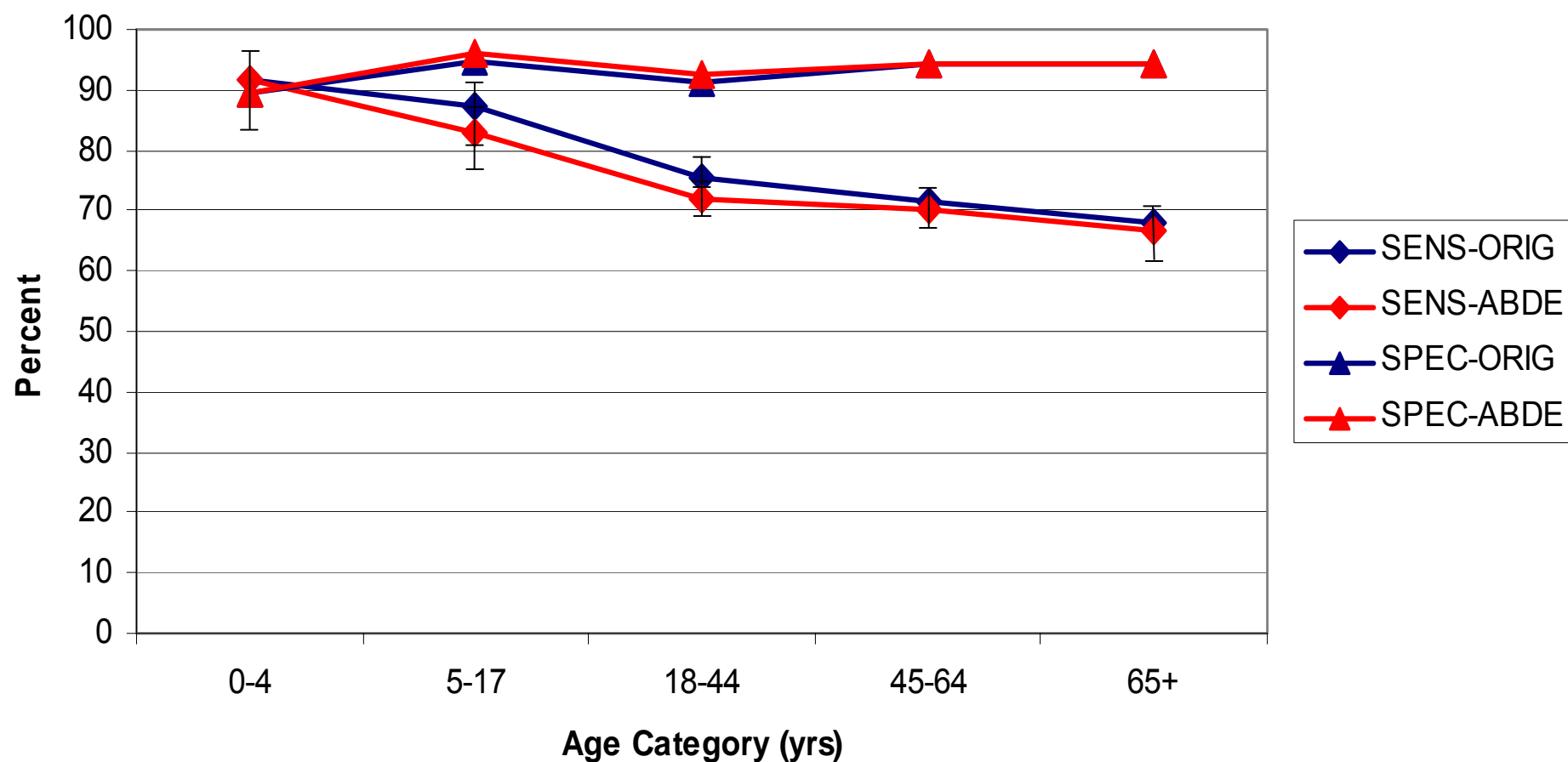
Sensitivity of ESSENCE vs. CDC Scheme, All Syndromes, All Ages





Results

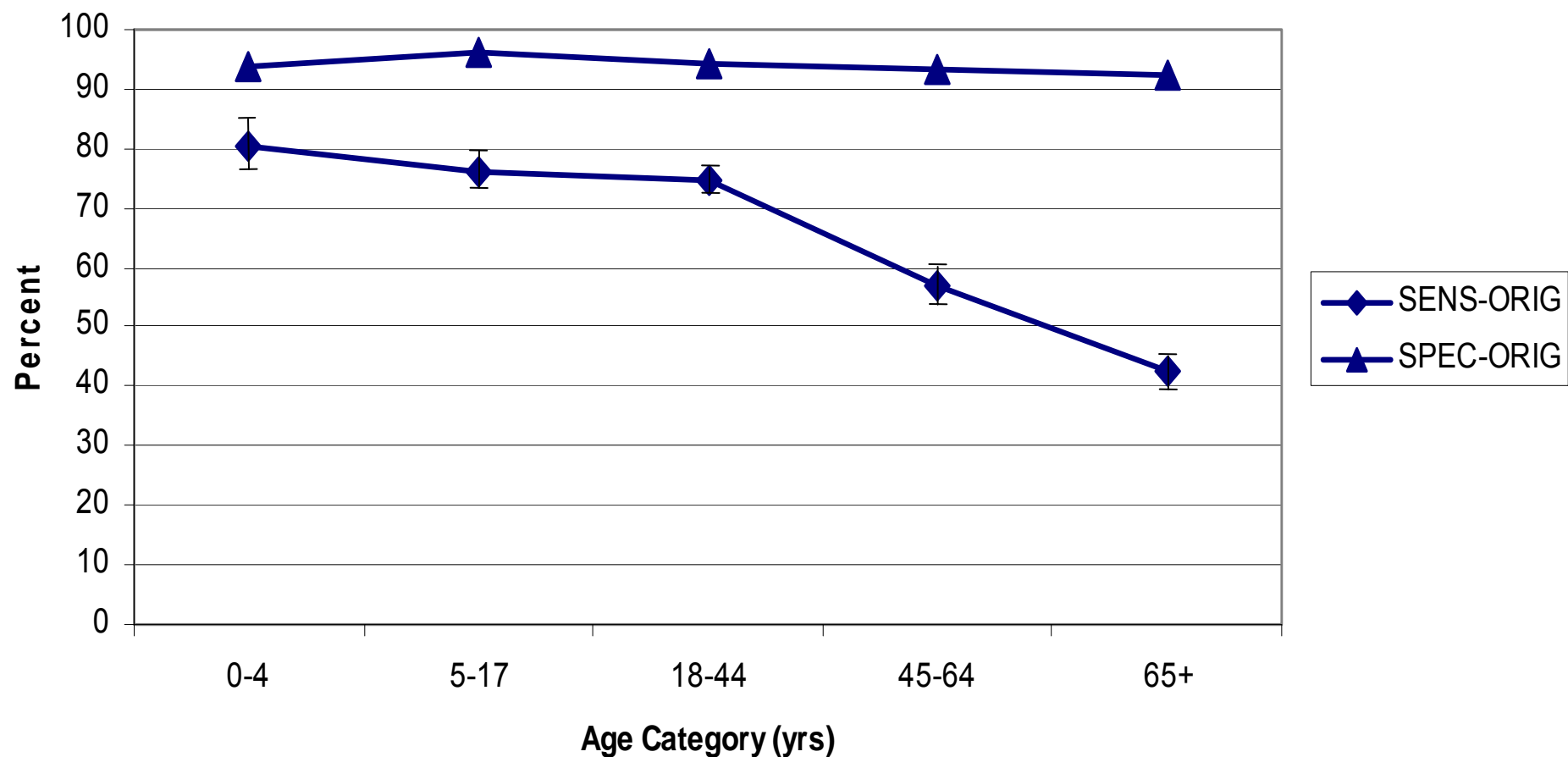
Effect of Adding ABD Exclusions on Validity of GI Syndrome





Results

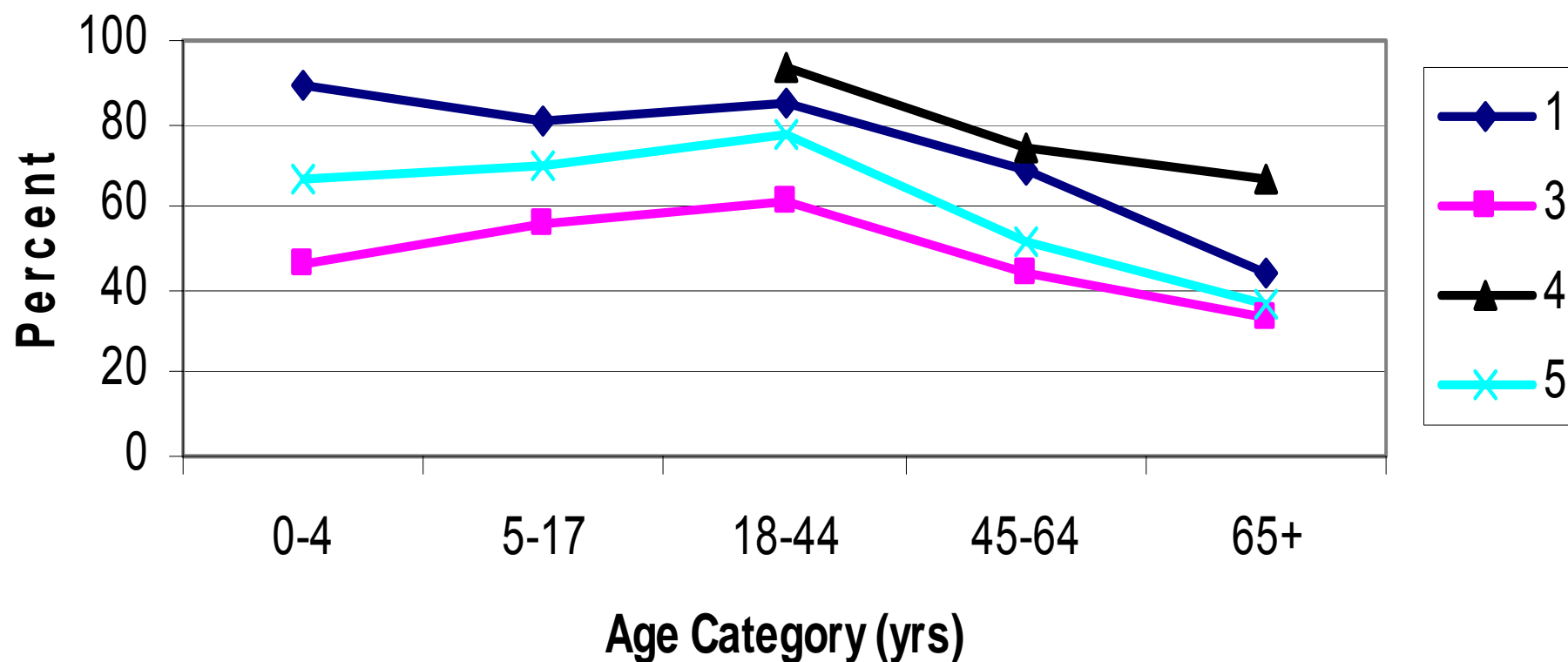
Validity of ESSENCE RESP Syndrome vs. CDC Scheme





Results

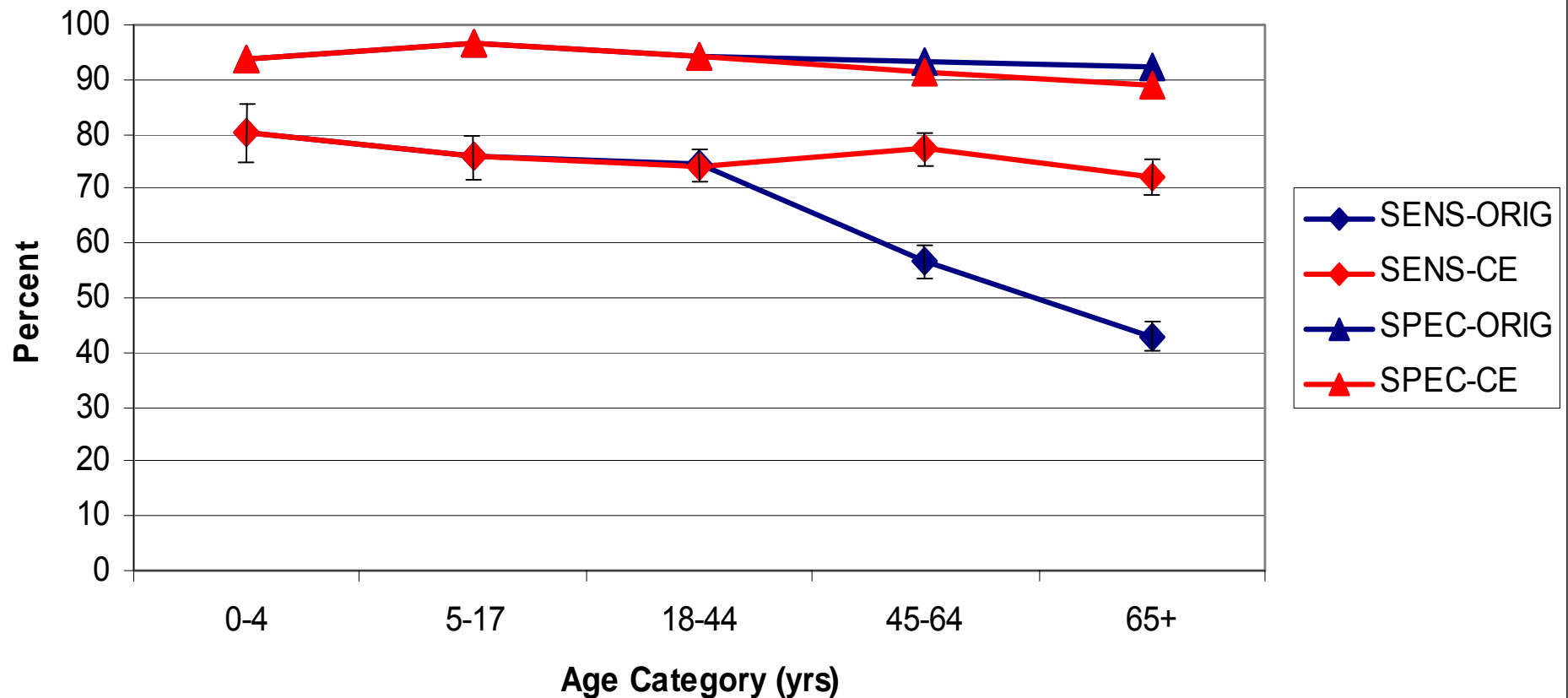
Sensitivity for RESP, by Age Category and Hospital





Results

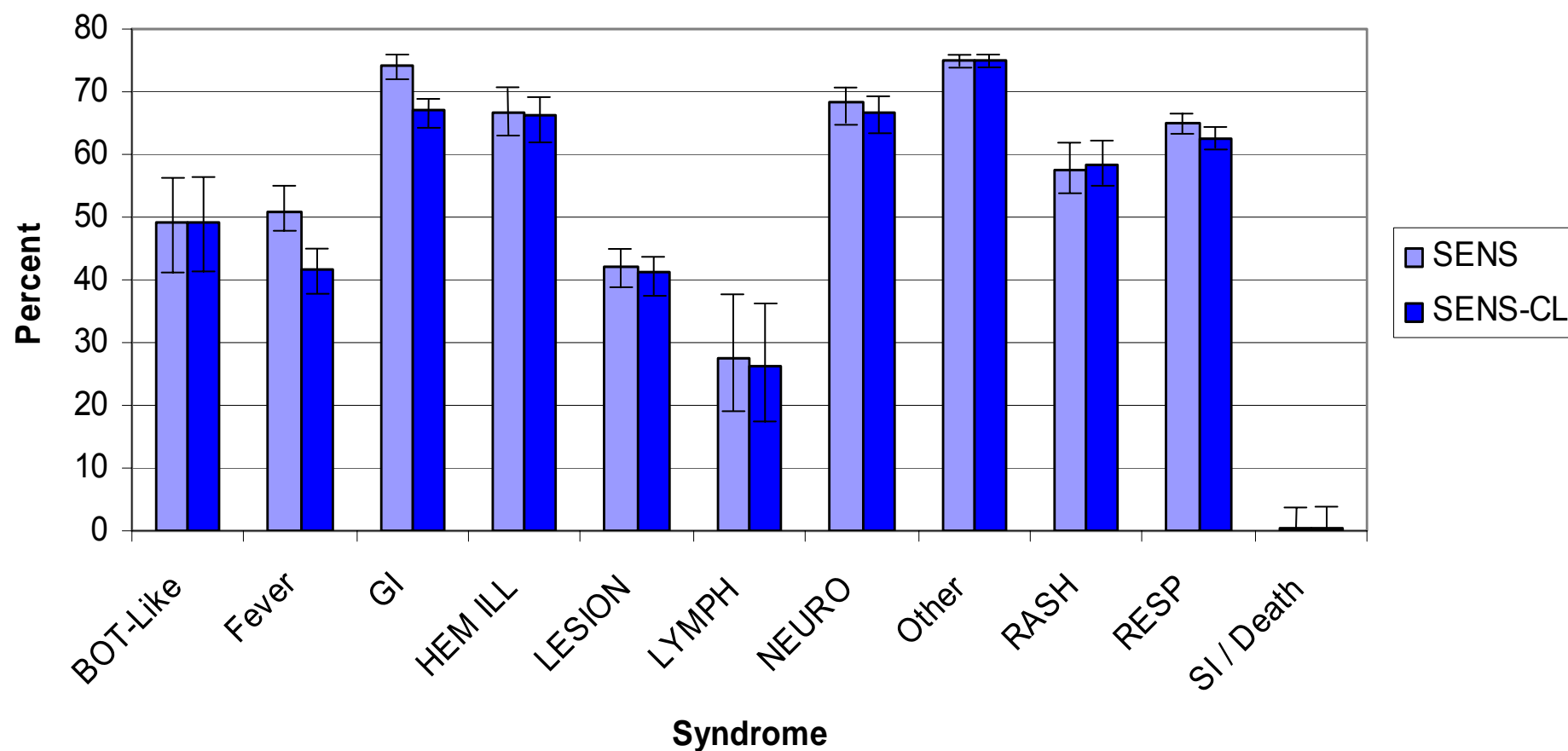
Effect on Validity of RESP Syndrome by Deleting 'Age>50 Rule' and Adding Cardiac Exclusions





Results

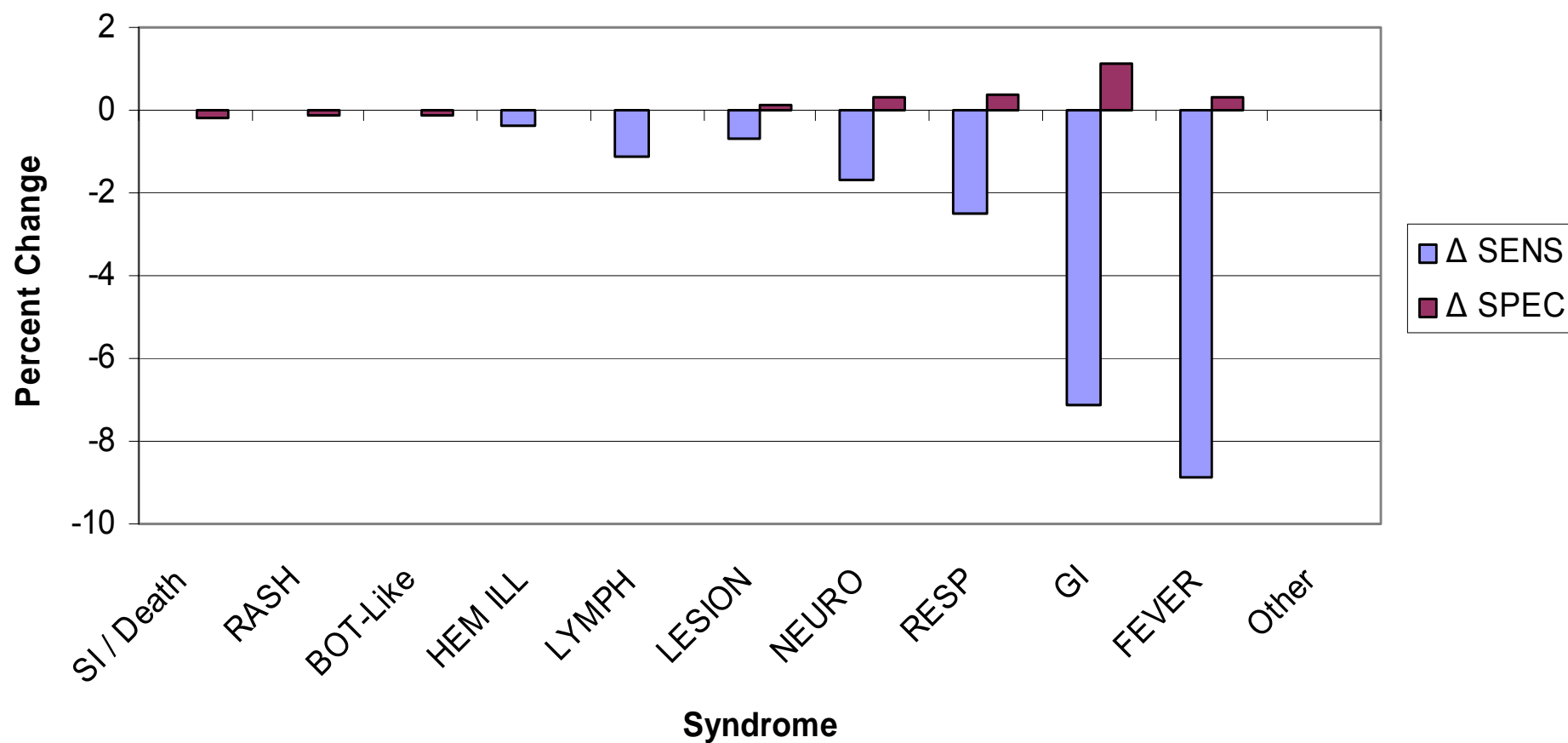
Effect on Sensitivity of Code to the Left Scheme





Results

Effect on Validity of Code to the Left, in Code to the Left Order





Discussion

- Significantly different performance of ESSENCE classification by syndrome, AGE CAT, and hospital (as seen in RESP)
- Some error a by-product of the use of the CDC framework, some simply bad coding
- Addition of ABD exclusions have marginal effect on GI syndrome validity



Discussion

- Addition of cardiac exclusions initially had no effect on validity of RESP syndrome
- BUT decreased SENS in RESP syndrome with increasing age appears to be real
- With the 'CP in age >50y = Other' rule removed, addition of cardiac exclusions improve validity of RESP syndrome



Discussion

- 'Code to the Left' increases SPEC progressively to the right
- 'Code to the Left' decreases SENS progressively to the right
- Losses in SENS outweigh gains in SPEC



Summary

- ESSENCE NLP parser successfully adapted to handle CDC syndromes
- Framework for evaluating alterations in classification schemes established



Summary

- New method for classifying ED CC with chest Sx yields greater validity for RESP syndrome in older ages
- ESSENCE 'Any and All' classification strategy offers increased SENS with minor losses in SPEC



Acknowledgments

- Funding provided by the US DHS Urban Areas Security Initiatives Program
- Many helpful comments from the National Capitol Region ESSENCE Enhanced Surveillance Operating Group



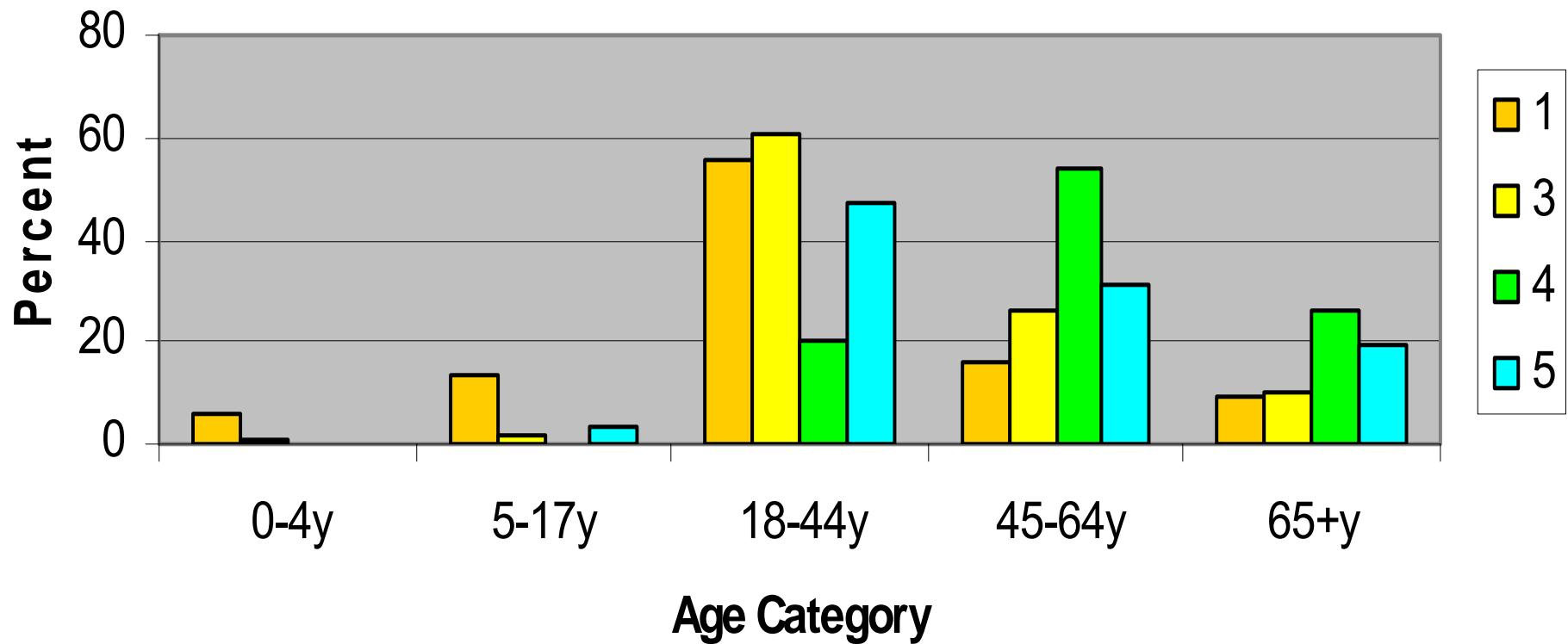
Summary

- Comments?
- Questions?



Results

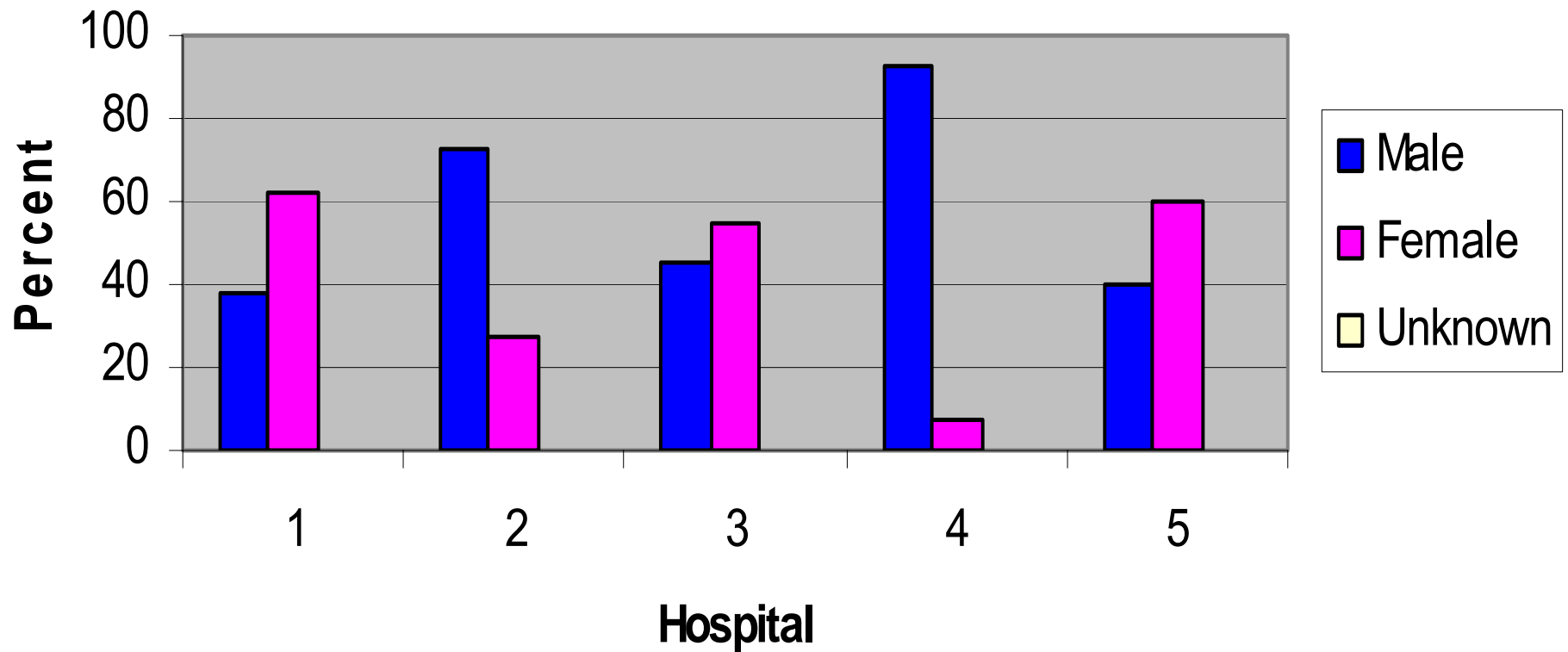
Age Distribution of Sample by Hospital





Results

Sex Distribution by Hospital





Results

Effect on Specificity of Code to the Left Scheme

